

**What is claimed is:**

1. A method of making a medical implant containing crosslinked polyethylene that is in contact with another piece, thereby forming an interface, wherein the method  
5 comprises:
  - a) compression molding of polyethylene to another piece, thereby forming an interlocked hybrid material;
  - b) irradiating the hybrid material by ionizing radiation; and
  - c) reducing free radicals in the crosslinked polyethylene by heating the  
10 hybrid material above the melting point of the crosslinked polyethylene.
2. The method according to claim 1, wherein the polyethylene comprises polyethylene resin powder, flakes, or particles, and wherein the polyethylene is compression molded to a metallic back.
- 15 3. The method according to claim 1, wherein the metallic back is shaped to serve as a fixation interface with the bone, through either bony growth or by bone cement.
4. The method according to claim 3, wherein the shapes are in the form of acetabular liner, tibial tray for total or unicompartmental knee implants, patella tray, glenoid component, ankle, elbow or finger component.
- 20 5. The method according to claim 1, wherein the irradiation is carried out in an atmosphere containing between about 1% and about 22% oxygen.
6. The method according to claim 1, wherein the irradiation is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.
- 25 7. The method according to claim 1, wherein the irradiation is carried out in a vacuum.
8. The method according to claim 1, wherein the heating temperature is above about 137°C.

9. The method according to claim 1, wherein the heating is carried out in an atmosphere containing between about 1% and about 22% oxygen.
10. The method according to claim 1, wherein the heating is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.
11. The method according to claim 1, wherein the heating is carried out in a vacuum.
12. The method according to claim 1, wherein the radiation dose is between about 25 and about 1000 kGy.
13. The method according to claim 1, wherein the radiation dose is about 50 kGy, about 100 kGy, about 200 kGy, about 300 kGy, about 400 kGy, about 500 kGy, about 600 kGy, about 700 kGy, about 800 kGy, about 900 kGy, or about 1000 kGy.
14. The method according to claim 1, wherein the piece is metallic or non metallic.
15. The method according to claim 1, wherein the piece is a metallic or a non metallic back, a ceramic, a tibial tray, a patella tray, or an acetabular shell.
16. The method of claim 1, wherein the piece comprises a metallic or a non-metallic mesh, an undercut, a recess or a combination thereof.
17. The method according to claim 1, wherein the interface is a metal-polymer.
18. The polymer according to claim 17 is a polyolefin.
19. The polyolefin of claim 18 is selected from a group consisting of a low-density polyethylene, high-density polyethylene, linear low-density polyethylene, ultra-high molecular weight polyethylene (UHMWPE), or mixtures thereof.
20. The method according to claim 1, wherein the implant comprises medical devices selected from the group consisting of bipolar hip replacements, tibial knee inserts with reinforcing metallic and polyethylene posts, and an implant that contains an interface that cannot be sterilized by a gas sterilization method.
21. The method according to claim 1, wherein the ionizing radiation is a gamma irradiation in a nitrogen atmosphere.

22. The method according to claim 1, wherein the ionizing radiation is an electron beam irradiation in a nitrogen atmosphere.
23. The method according to claim 1, wherein the reduction of free radicals in the crosslinked polyethylene is achieved by heating the implant in contact with a non-oxidizing medium.
24. The method according to claim 1, wherein the reduction of free radicals in the crosslinked polyethylene is achieved by contacting with a non-oxidizing medium and heating the medium to above the melting temperature of the irradiated polyethylene.
25. The method according to claim 24, wherein the non-oxidizing medium is an inert gas.
26. The method according to claim 24, wherein the non-oxidizing medium is an inert fluid.
27. The method according to claim 24, wherein the medium is a polyunsaturated hydrocarbon selected from the group consisting of: acetylenic hydrocarbons such as acetylene; conjugated or unconjugated olefinic hydrocarbons such as butadiene and (meth)acrylate monomers; and sulphur monochloride with chloro-tri-fluoroethylene (CTFE) or acetylene.
28. The method according to claim 1, wherein the reduction of free radicals in the crosslinked polyethylene is achieved by heating the implant to above the melting point of the polyethylene.
29. The method according to claim 1, wherein the reduction of free radicals in crosslinked polyethylene is achieved under an inert condition having no more than about 1% oxygen.
30. The method according to claim 29, wherein the condition is an inert atmosphere or a vacuum.
31. The method according to claim 30, wherein the inert atmosphere contains a gas selected from the group consisting of: nitrogen; argon; helium; and neon.
32. The method according to claim 1, wherein the implant is further sterilized by a gas.

33. The method according to claim 32, wherein the gas is ethylene oxide, gas plasma, or other gas.

34. The method according to claim 33, wherein ethylene oxide is used for sterilization.

5 35. The method according to claim 33, wherein gas plasma is used for sterilization.

36. A method of forming and sterilizing a medical implant containing crosslinked polyethylene that is in contact with another piece, thereby forming an interface, wherein the method comprises the steps of:

10 a) compression molding of polyethylene resin powder to another piece, thereby forming an interlocked hybrid material;

b) irradiating the hybrid material by ionizing radiation;

c) reducing free radicals in the crosslinked polyethylene by heating the hybrid material above the melting point of the crosslinked polyethylene; and

15 d) sterilizing the medical implant with a gas.

37. The method according to claim 36, wherein the irradiation is carried out in an atmosphere containing between about 1% and about 22% oxygen.

20 38. The method according to claim 36, wherein the irradiation is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.

39. The method according to claim 36, wherein the irradiation is carried out in a vacuum.

40. The method according to claim 36, wherein the heating is carried out in an atmosphere containing between about 1% and about 22% oxygen.

25 41. The method according to claim 36, wherein the heating is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.

42. The method according to claim 36, wherein the heating is carried out in a vacuum.
43. A method of forming and sterilizing a medical implant containing crosslinked polyethylene that is in contact with another piece, thereby forming an interface,  
5 wherein the method comprises the steps of:
- a) compression molding of polyethylene to another piece, thereby forming an interlocked hybrid material;
  - b) irradiating the hybrid material by ionizing radiation;
  - c) reducing free radicals in the crosslinked polyethylene by heating the  
10 hybrid material above the melting point of the crosslinked polyethylene; and
  - d) sterilizing the medical implant with a gas.
44. The method according to claim 43, wherein the irradiation is carried out in an atmosphere containing between about 1% and about 22% oxygen.
- 15 45. The method according to claim 43, wherein the irradiation is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.
46. The method according to claim 43, wherein the irradiation is carried out in a vacuum.
- 20 47. The method according to claim 43, wherein the heating is carried out in an atmosphere containing between about 1% and about 22% oxygen.
48. The method according to claim 43, wherein the heating is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.
- 25 49. The method according to claim 43, wherein the heating is carried out in a vacuum.
50. A medical implant containing crosslinked polyethylene that is in contact with another piece, thereby forming an interface, obtainable by:

a) compression molding of polyethylene resin powder to another piece, thereby forming an interlocked hybrid material;

b) irradiating the hybrid material by ionizing radiation; and

5 c) reducing free radicals in the crosslinked polyethylene by heating the hybrid material above the melting point of the crosslinked polyethylene.

51. The medical implant of claim 50, wherein the polyethylene is in contact with another piece, thereby forming an interlocking interface.

10 52. The medical implant of claim 50, wherein the interface is rendered substantially sterile.

53. The method according to claim 50, wherein the irradiation is carried out in an atmosphere containing between about 1% and about 22% oxygen.

15 54. The method according to claim 50, wherein the irradiation is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.

55. The method according to claim 50, wherein the irradiation is carried out in a vacuum.

56. The method according to claim 50, wherein the heating is carried out in an atmosphere containing between about 1% and about 22% oxygen.

20 57. The method according to claim 50, wherein the heating is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.

58. The method according to claim 50, wherein the heating is carried out in a vacuum.

25 59. A medical implant containing crosslinked polyethylene that is in contact with another piece, thereby forming an interface, obtainable by:

a) compression molding of polyethylene to another piece, thereby forming an interlocked hybrid material;

- b) irradiating the hybrid material by ionizing radiation; and
- c) reducing free radicals in the crosslinked polyethylene by heating the hybrid material above the melting point of the crosslinked polyethylene.

- 5 60. The medical implant of claim 59, wherein the polyethylene is in contact with another piece, thereby forming an interlocking interface.
61. The medical implant of claim 59, wherein the interface is substantially sterile.
62. The method according to claim 59, wherein the irradiation is carried out in an atmosphere containing between about 1% and about 22% oxygen.
- 10 63. The method according to claim 59, wherein the irradiation is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.
64. The method according to claim 59, wherein the irradiation is carried out in a vacuum.
- 15 65. The method according to claim 59, wherein the heating is carried out in an atmosphere containing between about 1% and about 22% oxygen.
66. The method according to claim 59, wherein the heating is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.
- 20 67. The method according to claim 59, wherein the heating is carried out in a vacuum.
68. An interface obtainable by:
- a) compression molding of polyethylene resin powder to another piece, thereby forming an interlocked hybrid material;
  - 25 b) irradiating the hybrid material by ionizing radiation; and
  - c) reducing free radicals in the polyethylene by heating the hybrid material above the melting point of the polyethylene.

69. The interface according to claim 68, wherein the piece is a metallic or a non-metallic component.
70. The interface according to claim 68, wherein the piece is a metallic back, a non-metallic back, a tibial tray, a patella tray, or an acetabular shell.
- 5 71. The interface of claim 68, wherein the piece comprises a metallic mesh, a non-metallic mesh, an undercut, a recess or a combination thereof.
72. The interface according to claim 68, wherein the interface is a metal-polymer.
73. The polymer according to claim 72 is a polyolefin.
74. The polyolefin of claim 73 is selected from a group consisting of a low-density  
10 polyethylene, high-density polyethylene, linear low-density polyethylene, ultra-high molecular weight polyethylene (UHMWPE), or mixtures thereof.
75. The method according to claim 68, wherein the irradiation is carried out in an atmosphere containing between about 1% and about 22% oxygen.
76. The method according to claim 68, wherein the irradiation is carried out in an  
15 inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.
77. The method according to claim 68, wherein the irradiation is carried out in a vacuum.
78. The method according to claim 68, wherein the heating is carried out in an  
20 atmosphere containing between about 1% and about 22% oxygen.
79. The method according to claim 68, wherein the heating is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.
80. The method according to claim 68, wherein the heating is carried out in a  
25 vacuum.
81. An interface obtainable by:
- a) compression molding of polyethylene to another piece, thereby forming an interlocked hybrid material;



- b) irradiating the hybrid material by ionizing radiation; and
- c) reducing free radicals in the polyethylene by heating the hybrid material above the melting point of the polyethylene.

82. The method according to claim 81, wherein the irradiation is carried out in an atmosphere containing between about 1% and about 22% oxygen.

83. The method according to claim 81, wherein the irradiation is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.

84. The method according to claim 81, wherein the irradiation is carried out in a vacuum.

85. The method according to claim 81, wherein the heating is carried out in an atmosphere containing between about 1% and about 22% oxygen.

86. The method according to claim 81, wherein the heating is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.

87. The method according to claim 81, wherein the heating is carried out in a vacuum.

88. The interface according to claim 81, wherein the piece is a metallic or a non-metallic component.

89. The interface according to claim 81, wherein the piece is a metallic back, a non-metallic back, a tibial tray, a patella tray, or an acetabular shell.

90. The interface of claim 81, wherein the piece comprises a metallic mesh, a non-metallic mesh, an undercut, a recess or a combination thereof.

91. The interface according to claim 81, wherein the interface is a metal-polymer.

92. The polymer according to claim 91 is a polyolefin.

93. The polyolefin of claim 91 is selected from a group consisting of a low-density polyethylene, high-density polyethylene, linear low-density polyethylene, ultra-high molecular weight polyethylene (UHMWPE), or mixtures thereof.

94. An interface obtainable by:

- a) compression molding of resin powder to another piece, thereby forming an interlocked hybrid material; and
- b) irradiating the hybrid material by ionizing radiation, wherein the interface is substantially sterile.

95. The method according to claim 94, wherein the irradiation is carried out in an atmosphere containing between about 1% and about 22% oxygen.

96. The method according to claim 94, wherein the irradiation is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.

97. The method according to claim 94, wherein the irradiation is carried out in a vacuum.

98. The interface according to claim 94, wherein the piece is a metallic or a non-metallic component.

99. The interface according to claim 94, wherein the piece is a metallic back, a non-metallic back, a tibial tray, a patella tray, or an acetabular shell.

100. The interface of claim 94, wherein the piece comprises a metallic mesh, a non-metallic mesh, an undercut, a recess or a combination thereof.

101. The interface according to claim 94, wherein the interface is a metal-polymer.

102. The polymer according to claim 101 is a polyolefin.

103. The polyolefin of claim 102 is selected from a group consisting of a low-density polyethylene, high-density polyethylene, linear low-density polyethylene, ultra-high molecular weight polyethylene (UHMWPE), or mixtures thereof.

104. An interface obtainable by:

- a) compression molding of polyethylene to another piece, thereby forming an interlocked hybrid material; and
- b) irradiating the hybrid material by ionizing radiation, wherein the interface is substantially sterile.

105. The method according to claim 104, wherein the irradiation is carried out in an atmosphere containing between about 1% and about 22% oxygen.

106. The method according to claim 104, wherein the irradiation is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.

107. The method according to claim 104, wherein the irradiation is carried out in a vacuum.

108. The interface according to claim 104, wherein the piece is a metallic or a non-metallic component.

109. The interface according to claim 104, wherein the piece is a metallic back, a non-metallic back, a tibial tray, a patella tray, or an acetabular shell.

110. The interface of claim 104, wherein the piece comprises a metallic mesh, a non-metallic mesh, an undercut, a recess or a combination thereof.

111. The interface according to claim 104, wherein the interface is a metal-polymer.

112. The polymer according to claim 111 is a polyolefin.

113. The polyolefin of claim 112 is selected from a group consisting of a low-density polyethylene, high-density polyethylene, linear low-density polyethylene, ultra-high molecular weight polyethylene (UHMWPE), or mixtures thereof.

114. An interface obtainable by:

a) compression molding of polyethylene resin powder to another piece, thereby forming an interlocked hybrid material;

b) irradiating the hybrid material by ionizing radiation; and

c) reducing free radicals in the polyethylene by heating the hybrid material above the melting point of the polyethylene, wherein the interface is substantially sterile.

115. The method according to claim 114, wherein the irradiation is carried out in an atmosphere containing between about 1% and about 22% oxygen.

116. The method according to claim 114, wherein the irradiation is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.
117. The method according to claim 114, wherein the irradiation is carried out in a vacuum.
118. The method according to claim 114, wherein the heating is carried out in an atmosphere containing between about 1% and about 22% oxygen.
119. The method according to claim 114, wherein the heating is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.
120. The method according to claim 114, wherein the heating is carried out in a vacuum.
121. The interface according to claim 114, wherein the piece is a metallic or a non-metallic component.
122. The interface according to claim 114, wherein the piece is a metallic back, a non-metallic back, a tibial tray, a patella tray, or an acetabular shell.
123. The interface of claim 114, wherein the piece comprises a metallic mesh, a non-metallic mesh, an undercut, a recess or a combination thereof.
124. The interface according to claim 114, wherein the interface is a metal-polymer.
125. The polymer according to claim 124 is a polyolefin.
126. The polyolefin of claim 125 is selected from a group consisting of a low-density polyethylene, high-density polyethylene, linear low-density polyethylene, ultra-high molecular weight polyethylene (UHMWPE), or mixtures thereof.
127. An interface obtainable by:
- a) compression molding of polyethylene to another piece, thereby forming an interlocked hybrid material;
  - b) irradiating the hybrid material by ionizing radiation; and

c) reducing free radicals in the polyethylene by heating the hybrid material above the melting point of the polyethylene, wherein the interface is substantially sterile.

5 128. The method according to claim 127, wherein the irradiation is carried out in an atmosphere containing between about 1% and about 22% oxygen.

129. The method according to claim 127, wherein the irradiation is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.

10 130. The method according to claim 127, wherein the irradiation is carried out in a vacuum.

131. The method according to claim 127, wherein the heating is carried out in an atmosphere containing between about 1% and about 22% oxygen.

15 132. The method according to claim 127, wherein the heating is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.

133. The method according to claim 127, wherein the heating is carried out in a vacuum.

134. The interface according to claim 127, wherein the piece is a metallic or a non-metallic component.

20 135. The interface according to claim 127, wherein the piece is a metallic back, a non-metallic back, a tibial tray, a patella tray, or an acetabular shell.

136. The interface of claim 127, wherein the piece comprises a metallic mesh, a non-metallic mesh, an undercut, a recess or a combination thereof.

137. The interface according to claim 127, wherein the interface is a metal-polymer.

25 138. The polymer according to claim 137 is a polyolefin.

139. The polyolefin of claim 138 is selected from a group consisting of a low-density polyethylene, high-density polyethylene, linear low-density polyethylene, ultra-high molecular weight polyethylene (UHMWPE), or mixtures thereof.

140. An acetabular assembly comprising:

- a) polyethylene compression molded to another piece, thereby forming an interlocked hybrid component;
- b) a substantially sterile interface; and
- c) a metallic back.

141. The assembly of claim 140, wherein the piece comprising a metallic mesh, a non-metallic mesh, an undercut, a recess, or a combination thereof.

142. The assembly of claim 140, wherein the polyethylene comprises powder, flakes, or particles, and wherein the polyethylene is compression molded to a counterface.

143. The assembly of claim 142, wherein the counterface is metallic back, a metallic mesh, a tibial tray, a patella tray, or an acetabular shell.

144. The assembly of claim 142, wherein the counterface is shaped to serve as a fixation interface with the bone, through either bony growth or by bone cement.

145. The assembly of claim 144, wherein the shapes are in the form of acetabular liner, tibial tray for total or unicompartmental knee implants, patella tray, glenoid component, ankle, elbow or finger component.

146. The assembly of claim 140, wherein the polyethylene is crosslinked by ionizing radiation.

147. The method according to claim 146, wherein the irradiation is carried out in an atmosphere containing between about 1% and about 22% oxygen.

148. The method according to claim 146, wherein the irradiation is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.

149. The method according to claim 146, wherein the irradiation is carried out in a vacuum.

150. The assembly of claim 146, wherein the radiation dose is between about 25 and about 1000 kGy.

151. The assembly of claim 146, wherein the radiation dose is about 50 kGy, about 100 kGy, about 200 kGy, about 300 kGy, about 400 kGy, about 500 kGy, about 600 kGy, about 700 kGy, about 800 kGy, about 900 kGy, or about 1000 kGy.
152. The assembly of claim 140, wherein the hybrid component is heated to a temperature above the melting point of the polyethylene.
153. The method according to claim 152, wherein the heating is carried out in an atmosphere containing between about 1% and about 22% oxygen.
154. The method according to claim 152, wherein the heating is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.
155. The method according to claim 152, wherein the heating is carried out in a vacuum.
156. The assembly of claim 152, wherein the heating temperature is above about 137°C.
157. An acetabular assembly comprising:
- a) a polyethylene acetabular liner compression molded to another piece, thereby forming an interlocked hybrid material;
  - b) a substantially sterile interface; and
  - c) a metallic back.
158. The assembly of claim 157, wherein the comprising a metallic mesh, a non-metallic mesh, an undercut, a recess, or a combination thereof.
159. The assembly of claim 157, wherein the polyethylene comprises powder, flakes, or particles, and wherein the polyethylene is compression molded to a counterface.
160. The assembly of claim 159, wherein the counterface is metallic back, a metallic mesh, a tibial tray, a patella tray, or an acetabular shell.
161. The assembly of claim 159, wherein the counterface is shaped to serve as a fixation interface with the bone, through either bony growth or by bone cement.

162. The assembly of claim 161, wherein the shapes are in the form of acetabular liner, tibial tray for total or unicompartmental knee implants, patella tray, glenoid component, ankle, elbow or finger component.

5 163. The assembly of claim 157, wherein the polyethylene is crosslinked by ionizing radiation.

164. The method according to claim 163, wherein the irradiation is carried out in an atmosphere containing between about 1% and about 22% oxygen.

165. The method according to claim 163, wherein the irradiation is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group  
10 consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.

166. The method according to claim 163, wherein the irradiation is carried out in a vacuum.

167. The assembly of claim 163, wherein the radiation dose is between about 25 and about 1000 kGy.

15 168. The assembly of claim 163, wherein the radiation dose is about 50 kGy, about 100 kGy, about 200 kGy, about 300 kGy, about 400 kGy, about 500 kGy, about 600 kGy, about 700 kGy, about 800 kGy, about 900 kGy, or about 1000 kGy.

169. The assembly of claim 157, wherein the hybrid component is heated to a temperature above the melting point of the polyethylene.

20 170. The method according to claim 169, wherein the heating is carried out in an atmosphere containing between about 1% and about 22% oxygen.

171. The method according to claim 169, wherein the heating is carried out in an inert atmosphere, wherein the inert atmosphere contains gas selected from the group consisting of nitrogen, argon, helium, neon, or the like, or a combination thereof.

25 172. The method according to claim 169, wherein the heating is carried out in a vacuum.

173. The assembly of claim 169, wherein the heating temperature is above about 137°C.



174. A medical implant comprising crosslinked polyethylene having substantially no detectable free radicals; and a sterile interlocking interface.

175. The implant of claim 174, wherein the polyethylene is in contact with another piece, thereby forming an interface.

5 176. The implant of claim 174, wherein the polyethylene is compression molded to another piece, thereby forming a mechanically interlocked hybrid material.

177. The implant of claim 174, wherein the polyethylene resin powder is compression molded to another piece, thereby forming a mechanically interlocked hybrid material.

10 178. The implant of claim 174, wherein the polyethylene is in contact with another piece, thereby forming an interlocking interface.

179. The implant of claim 178, wherein the piece is a metallic or a non-metallic component.

15 180. The implant of claim 178, wherein the piece is a metallic back, a non-metallic back, a tibial tray, a patella tray, or an acetabular shell.

181. The implant of claim 178, wherein the piece comprises a metallic mesh, a non-metallic mesh, an undercut, a recess or a combination thereof.

182. The implant of claim 174, wherein the interface is a metal-polymer.

183. The polyethylene according to claim 174 is a polyolefin.

20 184. The polyolefin of claim 183 is selected from a group consisting of a low-density polyethylene, high-density polyethylene, linear low-density polyethylene, ultra-high molecular weight polyethylene (UHMWPE), or mixtures thereof.

185. The implant of claim 174, wherein the polyethylene comprises powder, flakes, or particles, and wherein the polyethylene is compression molded to a counterface.

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